Practical knowledge and occupational competence

Felix Rauner
Institut Technik und Bildung (Institute of Technology and Education), University of Bremen

SUMMARY

The work-oriented change in the didactics of vocational education (VET) identifies 'significant' vocational work situations and the associated work process knowledge as the pivotal factor in the design of vocational curricula and processes. What is dramatic about this change of perspective is not merely the departure from academic, discipline-based teaching methods, but also the formulation of vocational teaching methods for VET practice and VET design that are predicated on development theory. As concerns the structurally oriented method of imparting VET, which underwent this change early on, it is necessary to differentiate the category of knowledge, above all with respect to practical knowledge and practical concepts, and also as a basis for domain-specific VET research.

Competence development in vocational curricula and work situations

Germany's tradition of discipline-based vocational school curricula is to be replaced by a system which prioritises the work and business processes characteristic of an occupation as the focus for curricula structured around learning fields (KMK, 1996). The processes formulated as objective requirements here nevertheless lend a subject-related quality to the curriculum at the same time. This is what is significant about the above-mentioned change of perspective. The 'learning field' concept is geared not to a systematic sequence of factual material, but to the idea of a meaningful set of relevant vocational work situations which trainees must learn to master increasingly well. Vocationally competent behaviour therefore becomes the subject of learning.

By emphasising learning as a subjective process of construction, recent discussion of teaching methodology and teaching/learning re-

search have highlighted more clearly than ever before the fundamental difference between knowledge-centred instruction and knowledge as acquired learning (cf. Wittrock, 1990).

The pedagogical trends implicitly pursued by the KMK (German Standing Conference of Education Ministers) via the learning field concept correspond to theories based on the development of competencies. Vocational curricula can be systematised not only technically but also as a developmental process from beginner (novice) to reflective mastery (expert) (cf. Dreyfus; Dreyfus, 1987; Rauner, 1999). From a development theory point of view, the objective side - i.e. the one presenting the learning requirements to the subject - still remains. This reflects the idea of someone being confronted by developmental tasks (Havighurst, 1972; Gruschka, 1985 ([1])) but not yet having solved them: what a person cannot yet do - for want of the requisite competence - he learns to do by confronting the task, which fosters in him the development of competence. On account of this developmental/methodological basic model, the concept of developmental tasks lends itself particularly well to the structuring of vocational learning processes. We ([2]) refer to 'paradigmatic' work tasks typical of vocational work (Benner, 1997) whenever the work contexts characteristic and typical of an occupation at the same time promote the development of occupational competence. The identification of such tasks presupposes an analysis of the objective circumstances constituting a given occupation: the artefacts, tools, methods and organisational forms of vocational work, as well as the (competing) demands made by vocational work. The most successful way of reconstructing the most important work tasks for the development of occupational competence is on the basis of 'expert workers' workshops' (cf. Norton, 1997; Bremer; Röben, 2001; Kleiner, 2005).

The expert workers' accounts of their work, training and projections are arranged in such a way as to match increasing stages of occupational competence development and the formation of occupational identity. Two difficulties which can only be overcome by qualification researchers with a degree of experience should be pointed out in this connection:

1) The identification of work tasks can rapidly stray to the level of abstract abilities which reveal very little about vocational expertise and the competencies it incorporates.

---

[1] Developmental task theory was first taken up in Germany in the college project on course evaluation. Blankertz refers in his introductory contribution to the symposium 'Didactics and identity formation in young people' (8th DGfE Congress in Regensburg, 1982) to the breadth of this approach: 'what I find interesting about the recourse made to Rousseau and Spranger is simply the high value being attached by a subject theory to teaching methods that are appropriate to systematic education at a young age. [...] Indeed, syllabuses, textbooks, curricular materials and classroom teachers at secondary II level often refer by way of illustration to individual disciplines and industrial technologies, without systematically taking into account the developmental tasks faced by pupils (Blankertz, 1983, p. 141).

[2] 'We' means a fairly large group of academics who have addressed ourselves in the past few years to the concepts and theories of task orientation in qualification and curriculum research (cf. ITB, 2002).

2) Work tasks which operate with the same artefacts and tools, and more-over superficially appear very similar, often prove to be extremely diverse in terms of the requisite occupational competence (cf. Stratmann, 1975).

Both of these difficulties can be overcome by means of vocationally oriented studies directed at analysing vocational work processes and tasks in situ (Lave; Wenger, 1991, p. 33; Röben, 2005). Interpreting and re-evaluating industrial work processes and tasks therefore means taking into account the interpretation model emerging in the context of communities of practice. Theo Wehner has coined the term 'local interpretation models' here. These are on the one hand imbued with social significance, but on the other hand they develop only in places where communities of practice operate (Wehner et al., 1996, p. 79). More specifically, what this means for qualification research is that the researcher must decode the work processes in situ as an interplay of work artefacts, tools and methods, and must decode the work organisation in its functionality, in its genesis and structurability as a technological and social process.

Figure 1: Vocational competence development 'from beginner to expert'
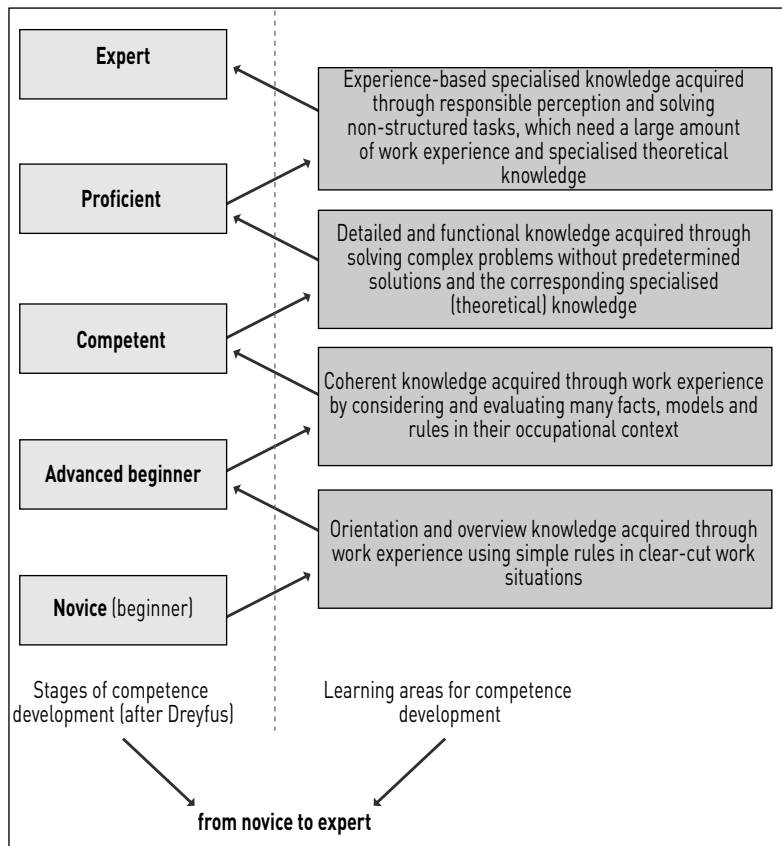
Bremer (2001) refers to the consequences of this for a work-oriented didactics of vocational education. For a trainee at the beginning of his vocational education, the new tasks and situations mark the start of a developmental process necessitates three elements: (1) vocational learning, (2) vocational work and (3) cooperation at work.

Developmental tasks have two didactic functions. First, they are used as an evaluation instrument to demonstrate the formation of occupational competence and identity at the (as yet unidentified) critical thresholds of occupational competence development (Bremer; Haasler, 2004). Second, developmental tasks are at the same time a didactic tool for establishing and designing vocational curricula as well as learning and working tasks for structurally oriented VET (vocational education and training) (cf. Howe et al., 2001).

The five stages of competence development identified by Hubert L. Dreyfus and Stuart E. Dreyfus, and the four corresponding developmental learning areas (Figure 1), have a hypothetical function for the identification of thresholds and stages in the development of occupational competence and identity; they also have a didactic function in the development of work-related and structurally oriented vocational courses (Rauner, 2002).

Expertise research also attaches crucial importance to developmental tasks, or their functional equivalents, for competence development. Regarding the development of occupational competence in nurses, for instance, Patricia Benner notes the paradigmatic significance of work situations in the step-by-step achievement of occupational competence in accordance with Dreyfus and Dreyfus' developmental model. Benner relates these developmental tasks to 'paradigmatic work situations' in the sense of cases which promote the competence of nursing staff (Benner, 1997).

Benner and Gruschka favour a change in the empirical access to real learning paths. Blankertz regards this change as dramatic not only owing to the departure from the discipline-based structuring of vocational curricula, but also in that competence development is governed by structures of meaning which demand a change of perspective in the trainee: 'he must anticipate his specific occupational role and identify with it - otherwise no competence development would be feasible' (Blankertz, 1983, p. 139).

Along with the subject of learning, i.e. the person whose skills are being developed from the level of deficient to competent, the analytical focus is also directed at learning processes beyond the pedagogical and organisational continuum of systematic instruction. The subject learns in situations whose quality becomes crucial to the learning outcomes. In a much more general pedagogical context, Lave and Wenger point out that learning as a path from inability to ability is accomplished as a process of integration into the community of practice of those who already demonstrate expertise (Lave; Wenger, 1991).

It has taken almost two decades in Germany to translate into didactic concepts the impetus generated by the attempt to explain competence development in VET in terms of development theory (cf. Bremer; Jagla, 2000; Rauner, 2004).

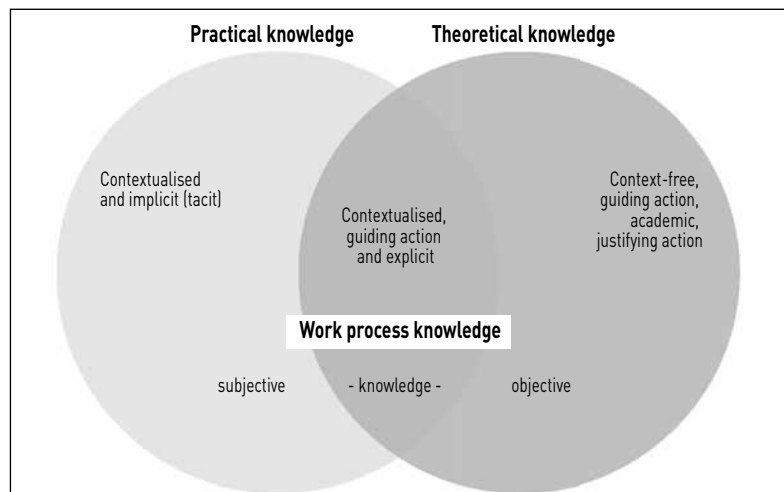## Dimensions of practical knowledge

In the context of the change in VET didactics concerning work and work processes, work process knowledge is regarded as a central category of knowledge: it is knowledge which arises from reflective work experience and is incorporated in practical work. Work process knowledge is a form of knowledge that guides practical work and, as contextualised knowledge, goes far beyond non-contextual theoretical knowledge (cf. Eraut et al., 1998).

Picking up on the discussion about work process knowledge initiated by Wilfried Kruse (Kruse, 1986), this key category has been identified and explored in numerous research projects as a form of knowledge fundamental to vocational learning (cf. Boreham et al., 2002; Fischer; Rauner, 2002).

Work process knowledge can be characterised in an initial approximation as a combination of practical and theoretical knowledge (Figure 2). The European 'Work Process Knowledge' research network bases its investigations into the subject on a working definition whereby work process knowledge is 'knowledge which

· is directly necessary in the work process (as opposed for example to discipline-based knowledge;

Figure 2: Work process knowledge as a combination of practical and theoretical knowledge and of subjective and objective knowledge

Practical knowledge		Theoretical knowledge
Contextualised and implicit (tacit)	Contextualised, guiding action and explicit	Context-free, guiding action, academic, justifying action
	Work process knowledge	
subjective	- knowledge -	objective

- is acquired in the work process itself, e.g. through experiential learning, but does not exclude the application of theoretical knowledge;
- encompasses a complete work process, in the sense of designing, planning, performing and assessing one's own work in the context of workplace processes' (Fischer, 2000, p. 36).

The category of practical knowledge will now be examined in more detail. This is especially crucial for VET, since what is directly at issue here is the relationship between work experience, knowledge and ability. We should refer at this juncture to the current discussion about the founding of a theory of social practice, as put forward for example by Andreas Reckwitz from a sociological perspective. From the point of view of VET research and pedagogy, it is interesting to note Reckwitz's reference to the implicit logic of practice, as expressed for instance in the artefacts of the working world and in the knowledge, interests and functions they represent.

According to Reckwitz's theory of practice, practical knowledge comprises:

1. 'knowledge in the sense of interpretive understanding, i.e. a routine assignment of meaning to objects, persons etc.;
2. methodical knowledge of 'script'-based procedures, or how to perform a series of actions competently;
3. motivational/emotional knowledge: an implicit sense of what one actually wants, what is at stake and what would not be feasible' (Reckwitz, 2003, p. 292).

This definition omits a dimension of practical knowledge which is relevant to VET research and pedagogy. The materiality of practice, as identified by Reckwitz, for example reduces technical artefacts to the dimension of the technical as a social process, in the theory of practice just as in established technical-sociological research. Curriculum theory requires a broader concept of the technical, encompassing the technical dimension of knowledge itself.

In examining paradigmatic work situations and tasks for nurses, Patricia Benner attaches constitutive importance to practical knowledge for occupational competence and takes up the cognitive theory positions substantiated by Schön in his 'epistemology of practice' (Schön, 1983). The six dimensions of practical knowledge identified by Benner (Benner, 1997) have gained currency in qualification and curriculum research. In qualification research, Bernd Haasler inter alia bases himself on this category-based framework for practical knowledge and confirms its usability in an empirical analysis of the extent to which manual work can be objectivised (Haasler, 2004).

(1) Sensitivity to fine qualitative differences (sensitivity)

A distinctive feature of practical vocational work is that, with increasing occupational experience, trained professionals develop ever greater sensitivity to fine and extremely fine situative differences in the percep-

tion and mastery of work situations. For example, a competent tool-maker, when removing the protruding parts of steel surfaces that have to be particularly flat, must possess exceptional technical sensitivity going beyond both the theoretical description of the requisite knowledge and expertise and the analysis of flat surface measurements and the machining algorithm to be derived therefrom. Experienced tool-makers are able, without lengthy reflection, to select correctly from thousands of tiny points on the steel surface they are shaving down which ones need to be removed, and can do so without being able to articulate the algorithm or rules they apply (Gerds, 2002).

(2) Shared understanding (contextuality)

Another aspect of practical vocational work is that, with increasing work experience beginning at the VET stage, members of occupational communities of practice possess an increasing body of similar and shared experiences. Their vocational work tasks are largely identical or similar. The language, stress, social norms and embedding of the specific vocational work in the process of social work constitute occupational traditions which lead to the emergence of comparable patterns of behaviour and appraisals. This ultimately results in an intuitive understanding that goes beyond verbal communication, enabling those concerned to work side by side even in very complex work situations without the need for many words (cf. Wehner et al., 1996).

(3) Assumptions, expectations and attitudes (situativity)

Practical knowledge comprises assumptions and expectations about typical work situations and work procedures. The interplay of experiential assumptions, attitudes and expectations, which leads to perceptual awareness (Holzkamp, 1985), on the one hand, and situative behaviour on the other constitutes an extremely fine differentiation of plans for action, going far beyond theory-driven activity. The narration and description of typical work situations initiated in technical discussions serves two purposes here: a contextualised account of work activity as an expression of situative assumptions, expectations and attitudes, and the decoding of their genesis. Furthermore, this contextualised access to practical knowledge ultimately makes it possible to differentiate more clearly between explicit and implicit work process knowledge.

(4) Paradigmatic work tasks (paradigmaticity)

Benner and Wrubel (1982) introduced the term 'paradigmatic cases' for the purposes of their vocationally oriented qualification research in the field of the nursing professions. Paradigmatic work tasks only include ones which are subjectively experienced as especially challenging and objectively afford new or additional work experience, but which are at the same time mastered on the basis of previous experience and previous knowledge in such a way that prior knowledge makes it possible to create prom-

ising plans for action. Paradigmatic developmental tasks have an objective side, inasmuch as vocationally oriented qualification research has shown which work tasks are typical of each developmental stage in the occupational progression from beginner to reflective mastery (expert) and whose accomplishment demands or promotes superior and more differentiated knowledge. One pre-requisite for curriculum development founded on development theory is the identification and analysis of vocational work tasks which have the quality of paradigmatic or developmental tasks.

(5) Communication in the community of practice (communicativity)

Experts develop highly economic forms of comprehension in a broad spectrum of verbal and non-verbal communication within their community of practice. The subjective significance of information communicated within a community of practice is largely coherent. The degree of technical understanding lies well above that of communication outside the enterprise. In vocational work processes it is necessary on the one hand to be extremely precise when using defined concepts, codes, norms and rules, which allow no - or virtually no - scope for subjective interpretation. On the other hand, practical knowledge and occupational competence are reflected in contextualised language and communication whose full significance is apparent only to members of the community of practice. Access to the practical knowledge of a community of practice presupposes that one understands its language (Becker, 2005).

(6) Unpredictable tasks and meta-competence (perspectivity)

Practical vocational activity takes place in work situations and contexts whose predictability varies from one occupation to another. New individual and collective practical knowledge arises constantly in such work situations, even though it is not possible to solve the fundamental problem of work situations that are in principle unpredictable. Related to this is a specific form of work-related stress, resulting from what can systematically be described as a knowledge gap (Drescher, 1996, p. 284). Thus work process knowledge is always incomplete knowledge, which is experienced subjectively in the case of unpredictable work tasks and constantly has to be bridged and completed in a given situation. In highly complex networked automated systems there is an additional unknown factor related to conditions and causes of faults. Faults of uncertain origin and temporary breakdowns make complex networked work systems even less transparent. Mastery of unpredictable work tasks - fundamentally incomplete knowledge (knowledge gap) in relation to non-transparent, non-deterministic work situations - is characteristic of practical work process knowledge. Wherever this is a feature of vocational work, meta-competence can be created, namely the ability to cope with the knowledge gap when solving unpredictable tasks and problems in vocational work.

The differentiation of the practical knowledge category as a dimension of the work process facilitates research into domain-specific knowledge,

which sheds more light on work process knowledge and in turn also promises to reveal more about the imparting of work process knowledge in or for vocational work processes. However, it provides only a partial answer to the overriding question of whether the loss of actuality of work process knowledge caused by accelerating change in the working world fundamentally devalues this knowledge as a point of reference for the development of occupational competence. A widely held popular thesis maintains that technical competence is devalued by the loss of actuality of vocational knowledge. Thus the technical dimension is in a sense shifted to a meta-level, where all that matters is to have appropriate access to technical knowledge documented in comfortable media, databases and knowledge management systems. Accessing the 'knowledge' required for specific work tasks - knowledge management - would be sufficient. Technical competence would vanish as a form of domain-specific method competence. Yet this thesis has been rejected by comprehensive studies on the transformation of skilled work and on skill requirements, above all in the field of diagnostic work. Some pertinent vocationally oriented studies, and expertise research too, have confirmed the opposite thesis, namely that the vocational work process knowledge underpinning technical occupational competence has in fact gained in significance (cf. Drescher, 1996; Becker, 2003; Rauner; Spöttl, 2002; Gerstenmaier, 2004).

VET practice, expertise research and vocationally oriented qualification research in the field of personal services and industrial work have unanimously concluded that domain-specific (technical) competence is the cornerstone of occupational competence (3). (To the extent that it is possible to put empirical curriculum research back on a firmer footing thanks to domain-specific qualification research, the diffuse formula of key qualifications takes a back seat.) Expertise and qualification research at the same time supports the concept of vocational learning in the context of meaningful work situations and hence the key programmatic idea of a curriculum structured around learning fields. The orientation of vocational learning according to (occupational) work and business processes - from a structurally oriented perspective - implies that work activity has a rationality of its own beyond the one-dimensional scientific rationality typical of the discipline-based curriculum. This finding has unleashed another controversial discussion in VET pedagogy about the connection between discipline-based and casuistic learning (cf. Fischer; Röben, 2004).

A widespread pedagogical belief in the specialised nature of vocational knowledge ties in with the German Educational Council's requirement that all training must be academically oriented, and assumes that specialist academic knowledge is the highest form of systematic knowledge, in which social knowledge is stored. Tade Tramm for instance does not in-

---

(³) Cf. on this point the proceedings of the HGTB and GTW conferences (Pahl; Rauner; Spöttl, 2000; Eicker; Petersen, 2001; Petersen; Rauner; Stuber, 2001), Gerstenmaier, 2003 from an expertise research perspective, and Gardner in his substantiation of multiple intelligence theory (2002).

terpret the KMK's reference to work and business process orientation in its hand-out on the development of learning fields (KMK, 1996) as a programmatic reference to an extended notion of competence, but links it to the discussion about inductive forms of learning, which in VET are ultimately always directed at 'opening up access to systematic knowledge and conceptual awareness, and hence moving from the pragmatic context to economic insights [in the field of business and administration, F. R.] and interpretations' (Tramm, 2002, p. 58).

This assumption, widespread in VET pedagogy, that discipline-based knowledge represents a kind of shadow occupational activity that - in procedural terms - guides occupational expertise, derives from a fundamental mistaking of categories, as is demonstrated inter alia by Neuweg (2000) and Fischer (2002) (cf. on this point also Heritage, 1984, p. 298 ff).

Our interim conclusion would therefore be that the development of occupational competence occurs in a process of reflective practical experience. According to Schön, the development of occupational competence is based on an extension of the repertoire of individual cases with which the learner is confronted in the developmental process. Schön, however, underestimates here the contribution made by school-centred VET, if it is successful in turning work process knowledge and its communication in activity-oriented forms of learning into the cornerstone of curriculum development and course design. That then means systematising teaching and learning content along developmental lines, since occupational competence can only be developed in that way - and not along discipline lines.

The notions of practical knowledge and 'reflection on and in action' correspond to Klaus Holzkamp's notion of practical concepts (Holzkamp, 1985, p. 226 ff.). He maintains that the concepts which people use subjectively are basically practical, in that their elements, scope and fields of meaning (i.e. the sum of their elements of meaning and their context) are affected by the individual developmental processes. Scientifically defined concepts, however, represent only a fraction of the elements of meaning of practical concepts and hence determine (occupational) competence to only a very limited extent.

Members of different communities of practice have their own domain-specific practical concepts, in which the domain-specific connotations of objects form specific semantic fields (Wehner; Dick, 2001). The semantic fields of practical concepts become blurred at the edges, change their scope with every new experience, are in themselves quite contradictory, and their elements of meaning are often associated with other practical concepts. The significance of individual elements of meaning can only be clarified (in a domain-specific fashion) by taking into account the skill profile of an occupation. Subjective interpretations of elements of meaning are exposed to a continual process of change, embedded in the processes of competence development. It is therefore necessary to investigate in more detail whether and how the semantic fields for the same concept overlap in different occupations, how the elements of meaning correspond

to one another and in what way they are linked to other semantic fields. Practical concepts not only regulate ongoing work activity at a given time; they also underpin communication within and between communities of practice by symbolically representing contextualised circumstances. These processes of forming practical concepts that guide action and facilitate communication in communities of practice take place above all as situated learning. It is the task of technical and vocational didactic research to investigate beginners' prior understanding - or their subjective semantic fields for technical concepts - and experts' occupational semantic fields for key technical concepts. Only then will it be possible to devise teaching and learning strategies which enable the semantic fields and structures of everyday concepts and theories gradually to be transformed into occupational semantic fields.

Conclusions

The traditional comparison made in pedagogical discussion between discipline-based and casuistic learning is misleading. The didactic concept of activity-led acquisition of discipline-based knowledge is predicated on a scientistic misconception of the relationship between knowledge and competence. The importance of specialised technical curriculum content for the process of developing occupational competence is greatly overestimated. In the area of industrial and technical VET, some elements of the work-related semantic fields are denoted with definitional knowledge, even if it is acquired through inductive teaching and learning methods. By contrast, the domain-specific practical concepts (Holzkamp, 1985, p. 266 ff.) acquired in the process of occupational competence development and the related subjective theories, as well as the understanding of the work process context, serve to guide action. This process cannot be dissociated from that of integrating into the community of practice.

Empirical VET research must therefore investigate in a domain-specific fashion, for each profession or occupation, what prior understanding and what experiences impact on the relevant vocational concepts and subjective theories of learners. Moving on from there, the steps and stages in the developmental communication of work process knowledge must be explored didactically. To this extent, the developmental systematisation of working and learning situations, e.g. in the form of case-work and projects, is an appropriate form of systematic VET where there is an opportunity to acquire extensive, meaningful and action-guiding concepts and theories, as well as behavioural strategies, embedded in and supported by the process of vocational identity-building. The topicality of this discussion arises out of the European project on the introduction of modular certification systems for vocational education as well as the opposite trend internationally towards the re-establishment of dual training models (e.g. in Malaysia, Oman, Italy, Holland and Scotland).

Bibliography

Becker, Matthias. *Diagnosearbeit im Kfz-Handwerk als Mensch-Maschine-Problem. Konsequenzen des Einsatzes rechnergestützter Diagnosesysteme für die Facharbeit.* PhD thesis. Bielefeld: W. Bertelsmann, 2003.

Becker, Matthias. Handlungsorientierte Fachinterviews. In: Felix Rauner (ed.): *Handbuch Berufsbildungsforschung*. Bielefeld: Bertelsmann, 2005, p. 601-606.

Benner, Patricia. *Stufen zur Pflegekompetenz*. From Novice to Expert. (2nd reprint) Bern: Hans Huber, 1997.

Benner, Patricia; Wrubel, Judith. Skilled clinical knowledge: The value of perceptual awareness. Part 1+2. *Journal of Nursing Administration, 12*(5)+(6), 1982.

Blankertz, Herwig. Einführung in die Thematik des Symposiums. In: Dietrich Benner; Helmut Heid; Hans Thiersch (eds.): Beiträge zum 8. Kongress der Deutschen Gesellschaft für Erziehungswissenschaften vom 22.-24. März 1982 in der Universität Regensburg. *Zeitschrift für Pädagogik*, 18th supplement. Weinheim, Basle, 1983, p. 139-142.

Boreham, Nicholas; Fischer, Martin; Samurçay, Renan: *Work Process Knowledge*. London: Routledge Research, 2002.

Bremer, Rainer. Entwicklung integrierter Berufsbildungspläne und Lernortkooperation. In: Peter Gerds; Arnulf Zöller (eds.). *Der Lernfeldansatz der Kultusministerkonferenz*. Bielefeld: W. Bertelsmann. p. 111-139, 2001.

Bremer, Rainer; Haasler, Bernd. Analyse der Entwicklung fachlicher Kompetenz und beruflicher Identität in der beruflichen Erstausbildung. In: *Bildung im Medium beruflicher Bildung. Zeitschrift für Pädagogik* (ZfPäd) 2/2004, Vol. 50, p. 162-181.

Bremer, Rainer; Jagla, Hans-Herbert (eds.). *Berufsbildung in Geschäfts- und Arbeitsprozessen*. Bremen: Donat, 2000.

Bremer, Rainer; Rauner, Felix; Röben, Peter. Der Experten-Facharbeiter-Workshop als Instrument der berufswissenschaftlichen Qualifikationsforschung. In: F. Eicker; A. W. Petersen (eds.): *Mensch-Maschine-Interaktion. Arbeiten und Lernen in rechnergestützten Arbeitssystemen in Industrie, Handwerk und Dienstleistung (HGTB 1999)*. Baden-Baden: Nomos, 2001, p. 211-231.

Drescher, Ewald. *Was Facharbeiter können müssen. Elektroinstandhaltung in der vernetzten Produktion*. Bremen: Donat, 1996.

Dreyfus, Hubert; Dreyfus, L.; Stuart E.. *Künstliche Intelligenz. Von den Grenzen der Denkmaschine und dem Wert der Intuition*. Reinbek bei Hamburg: Rowohlt, 1987.

Eraut, Michael; Alderton, Jane; Cole, Gerald; Senker, Peter. *Development of knowledge and skills in employment*. Brighton: Institute of Education, University of Sussex, 1998.

Fischer, Martin. Arbeitsprozesswissen von Facharbeitern - Umrisse einer forschungsleitenden Fragestellung. In: Pahl, Jörg-Peter; Rauner,

Felix; Spöttl, Georg (eds.): *Berufliches Arbeitsprozesswissen. Ein Forschungsgegenstand der Berufsfeldwissenschaften*. Baden-Baden: Nomos, 2000, p. 31-47.

Fischer, Martin. Die Entwicklung von Arbeitsprozesswissen durch Lernen im Arbeitsprozess - theoretische Annahmen und empirische Befunde. In: Martin Fischer; Felix Rauner (eds.): *Lernfeld: Arbeitsprozess. Ein Studienbuch zur Kompetenzentwicklung von Fachkräften in gewerblich-technischen Aufgabenbereichen.* Baden-Baden: Nomos, 2002, p. 53-86.

Fischer, Martin; Rauner, Felix (eds.). *Lernfeld: Arbeitsprozess.* Ein Studienbuch zur Kompetenzentwicklung von Fachkräften in gewerblich-technischen Aufgabenbereichen. Baden-Baden: Nomos, 2002.

Fischer, Martin; Röben, Peter. Arbeitsprozesswissen im Fokus von individuellem und organisationalem Lernen. Ergebnisse aus Großbetrieben in vier europäischen Ländern. In: *Zeitschrift für Pädagogik* 2/2004, Beltz-Verlag.

Gerds, Peter. Handwerkliches Können und maschinelle Präzision beim Herstellen tragender Flächen. In: Fischer, Martin; Rauner, Felix (eds.). *Lernfeld: Arbeitsprozess.* Baden-Baden: Nomos, 2002. p. 175-193.

Gerstenmaier, Jochen. Domänenspezifisches Wissen als Dimension beruflicher Entwicklung. In: Felix Rauner (ed.): *Qualifikationsforschung und Curriculum.* Bielefeld: W. Bertelsmann, 2004. p. 151-163.

Gruschka, Andreas (ed.). *Wie Schüler Erzieher werden. Studie zur Kompetenzentwicklung und fachlichen Identitätsbildung in einem doppeltqualifizierenden Bildungsgang des Kollegschulversuchs NW.* (2 vols). Wetzlar: Büchse der Pandora, 1985.

Haasler, Bernd (ed.). *Hochtechnologie und Handarbeit. Eine Studie zur Facharbeit im Werkzeugbau der Automobiltechnologie.* Bielefeld: Bertelsmann, 2004.

Havighurst, Robert J.. *Developmental Tasks and Education*. New York: David McKay, 1972.

Heritage, John. *Garfinkel and Ethnomethodology*. Cambridge: Polity Press, 1984EN.REFLIST.

Holzkamp, Klaus. *Grundlagen der Psychologie*. Frankfurt/Main, New York: Campus, 1985.

Howe, Falk; Heermeyer, Reinhard; Heuermann, Horst; Höpfner, Hans-Dieter; Rauner, Felix. *Lern- und Arbeitsaufgaben für eine gestaltungsorientierte Berufsbildung*. Konstanz: Christiani, 2001.

ITB (ed.). *Bericht über Forschungsarbeiten 2000-2001*. ITB-Arbeitspapier Nr. 42. Bremen: Institut Technik und Bildung der Universität, 2002.

Kleiner, Michael (ed.). Berufswissenschaftliche Qualifikationsforschung im Kontext der Curriculumentwicklung. Beschreibung der Facharbeit des Industriemechanikers anhand von Beruflichen Arbeitsaufgaben zur Entwicklung von Lernfeldern. *Studien zur Berufspädagogik*, Vol. 18. Hamburg: Verlag Dr. Kovač, 2005.

KMK - KMK Secretariat (ed.). *Handreichungen für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz (KMK) für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte Ausbildungsberufe.* Bonn, 1996.

Kruse, Wilfried. Von der Notwendigkeit des Arbeitsprozeßwissens. In: Jochen Schweitzer (ed.): *Bildung für eine menschliche Zukunft.* Weinheim, Basle, 1986, p. 188-193.

Lave, Jean; Wenger, Etienne. *Situated Learning. Legitimate Peripheral Participation.* New York: Cambridge University Press, 1991.

Neuweg, Georg Hans (ed.). *Wissen - Können - Reflexion. Ausgewählte Verhältnisbestimmungen.* Innsbruck, Vienna, Munich: Studien-Verlag, 2000.

Norton, Robert E. DACUM Handbook. The National Centre on Education and Training for Employment. Columbus/Ohio: The Ohio State University, 1997.

Polanyi, Michael. *Personal Knowledge.* Towards a Post-Critical Philosophy. Chicago: University of Chicago Press, 1958.

Rauner, Felix. Entwicklungslogisch strukturierte berufliche Curricula: Vom Neuling zur reflektierten Meisterschaft. In: Rolf Dubs; Antonius Lipsmeier; Günter Pätzold (eds.): *ZBW*. Vol. 95. 3rd quarter of 1999. Issue 3, p. 424-446.

Rauner, Felix. Berufliche Kompetenzentwicklung - vom Novizen zum Experten. In: Peter Dehnbostel; Uwe Elsholz; Jörg Meister; Julia Meyer-Menk (eds.): *Vernetzte Kompetenzentwicklung.* Alternative Positionen zur Weiterbildung. Berlin: Edition Sigma, 2002. p. 111-132.

Rauner, Felix; Spöttl, Georg (eds.). *Der Kfz-Mechatroniker - Vom Neuling zum Experten.* Bielefeld: W. Bertelsmann, 2002.

Rauner, Felix (ed.). *Handbuch Berufsbildungsforschung.* Bielefeld: Bertelsmann, 2005.

Reckwitz, Andreas. Grundelemente einer Theorie sozialer Praktiken: eine sozialtheoretische Perspektive. In: *Zeitschrift für Soziologie*, Vol. 32, Issue 4, August 2003. p. 282-301.

Röben, Peter. Arbeitsprozesswissen und Expertise. In: A. Willi Petersen; Felix Rauner; Franz Stuber (eds.): *IT-gestützte Facharbeit - Gestaltungsorientierte Berufsbildung.* Baden-Baden: Nomos, 2001. p. 43-57.

Röben, Peter. Berufswissenschaftliche Aufgabenanalyse. In: Rauner, Felix (ed.): *Handbuch Berufsbildungsforschung.* Bielefeld: Bertelsmann, 2005. p. 606-611.

Schön, Donald A. *The Reflective Practitioner. How Professionals Think in Action.* New York: Basic Books, 1983.

Stratmann, Karlwilhelm. Curriculum und Curriculumprojekte im Bereich der beruflichen Aus- und Fortbildung. In: Karl Frey (ed.): *Curriculum Handbuch*, Vol. III. Munich: Piper & Co., 1975, p. 335-349.

Tramm, Tade. Zur Relevanz der Geschäftsprozessorientierung und zum Verhältnis von Wissenschafts- und Situationsbezug bei der Umsetzung des Lernfeldansatzes im kaufmännischen Bereich. In: Reinhard Bader; Peter F. E. Sloane (eds.): *Bildungsmanagement im Lernfeldkonzept. Curriculare und organisatorische Gestaltung.* Paderborn: Eusl, 2002. p. 41-62.

Wehner, Theo; Clases, Christoph; Endres, Egon. Situiertes Lernen und kooperatives Handeln in Praxisgemeinschaften. In: Egon Endres; Theo Wehner (eds.): *Zwischenbetriebliche Kooperation. Die Gestaltung von Lieferbeziehungen.* Weinheim: Beltz-Verlag, 1996. p. 71-85.

Wehner, Theo; Dick, Michael. Die Umbewertung des Wissens in der betrieblichen Lebenswelt: Positionen der Arbeitspsychologie und betroffener Akteure. In: (ed.): *Wissen in Unternehmen. Konzepte, Maßnahmen, Methoden.* Berlin: Erich Schmidt, 2001. p. 89-117.